What is claimed is:

1. A hydraulic holder comprising:

(a) a shank for mating engagement with a rotating machining device;

(b) a nosepiece in axial alignment with the shank having an axial bore; and

(c) a hydraulic cartridge fixedly mounted in the bore, whereby the hydraulic cartridge may be actuated to clamp a tool or a workpiece in the inner bore of the cartridge.

2. A hydraulic cartridge comprising:

(a) a cartridge shell;

(b) surrounding a cartridge body;

(c) the cartridge body having a hydraulic circuit filled with hydraulic fluid, a means of compressing the hydraulic fluid within the hydraulic circuit, and a deformable inner wall surrounding an inner bore so that upon compression of the hydraulic fluid within the hydraulic circuit the inner wall deforms into the inner bore for mating engagement with a tool or workpiece within the inner bore.

3. A hydraulic holder comprising:

(a) a shank for mating engagement with a rotating machining device;

(b) a nosepiece in axial alignment with the shank having an axial bore and a first actuator access port;

(c) a cartridge inserted into the axial bore of the nosepiece;

(d) the cartridge having a body and a shell surrounding the body;

(e) the shell having a second actuator access port in radial alignment with the first actuator access port;

(f) the body having a hydraulic circuit filled with hydraulic fluid, the hydraulic circuit having a piston in a piston cylinder which piston cylinder is in radial alignment with the first and second actuator access ports whereby longitudinal movement of the piston into the piston cylinder compresses the hydraulic fluid against a deformable inner wall surrounding an inner bore which inner bore is configured for mating engagement with an inserted tool or workpiece, and the tool or workpiece is clamped in the inner bore by compression of the deformable wall by the hydraulic fluid.

4. The cartridge of claim 2, wherein the means for compression of the hydraulic fluid within the cartridge is:

(a) an actuator access port in the cartridge shell and

(b) a piston in a piston cylinder which piston cylinder is in radial alignment with the actuator access port in the cartridge shell whereby longitudinal movement of the piston into the piston cylinder compresses the hydraulic fluid within the cartridge.

5. The hydraulic holder of claim 1, further comprising:

(a) a first actuator access port in the nosepiece of the holder;

(b) a second actuator access port in a cartridge shell in radial alignment with the first actuator access port;

(c) a cartridge body fluid tightly affixed in the cartridge shell;

(d) the cartridge body having (i) a piston cylinder in radial alignment with the first actuator access port and the second actuator access port, (ii) a first annular positioning ring with the piston cylinder extending radially through the first annular positioning ring and at least one channel disposed longitudinally in the first annular positioning ring and in communication with the piston cylinder and with an upper

clamping band, (iii) a first end of the upper clamping band adjacent the first annular positioning ring and surrounding a portion of a deformable inner wall, (iv) a second annular positioning ring adjacent a second end of the upper clamping band and surrounding a portion of the inner wall, the second annular positioning ring having at least one longitudinally disposed clamping channel, (v) a lower clamping band with a first end of the lower clamping band adjacent the second annular positioning ring and the lower clamping band surrounding a portion of the inner wall that is deformable, (vi) a third annular positioning ring adjacent a second end of the lower clamping band and surrounding a portion of the inner wall, (vii) the inner wall surrounding and forming an inner bore, (viii) an actuator adjustable radially through the first annular positioning ring, a piston moveable by the actuator, and a seal moveable by the piston through a seal displacement range, the actuator, piston, and seal in radial alignment with one another in the piston cylinder so that the seal is proximate to the at least one channel, and (ix) hydraulic fluid filling the portion of the piston cylinder proximate the seal, at least one channel, the upper clamping band, the at least one clamping channel, and the lower clamping band.

6. An apparatus for clamping a tool or workpiece in a rotating machining device, comprising:

(a) a shank for mating engagement with a rotating machining device having an axial bore therein;

(b) a hydraulic cartridge fixedly engaged in the bore of the shank, for clamping a tool or workpiece in the inner bore of the cartridge.

7. An apparatus for clamping a tool or workpiece in a rotating machining device, comprising:

(a) a shank for mating engagement with a rotating machining device;

(b) a nosepiece affixed in axial alignment to the shank having an axial bore therein; and

(c) a hydraulic cartridge fixedly engaged in the bore of the nosepiece, for clamping a tool or workpiece in the inner bore of the cartridge.

8. The apparatus of claim 7, further comprising:

(a) a first actuator access port in the nosepiece;

(b) a second actuator access port in a cartridge shell in radial alignment with the first access port in the nosepiece;

(c) a cartridge body affixed fluid tight in the cartridge shell; and

(e) the cartridge body having (i) a piston cylinder in axial alignment with the first and second actuator access ports, (ii) a first annular positioning ring having the piston cylinder extending radially through the first annular positioning ring and at least one channel disposed longitudinally in the first annular positioning ring and in communication with the piston cylinder, (iii) an upper clamping band with a first end of the upper clamping band adjacent the first annular positioning ring and surrounding a portion of a deformable inner wall, (iv) a second annular positioning ring adjacent a second end of the upper clamping band, surrounding a portion of the inner wall, and having at least one longitudinally disposed clamping channel, (v) a lower clamping band with a first end of the lower clamping band adjacent the second annular positioning ring and surrounding a portion of the inner wall that is deformable, (vi) a third annular positioning ring adjacent a second end of the lower clamping band and surrounding a portion of the inner wall, (vii) the inner wall surrounding and forming a tool inner bore, (viii) an actuator adjustable radially

through the first annular positioning ring, a piston moveable by the actuator, and a seal moveable by the piston through a seal displacement range, the actuator, piston, and seal in axial alignment with one another in the piston cylinder so that the seal is proximate to the at least one channel, and (ix) hydraulic fluid filling the portion of the piston cylinder proximate the seal, the at least one channel, the upper clamping band, the at least one clamping channel, and the lower clamping band.

9. The hydraulic toolholder of claim 1, wherein the hydraulic circuit comprises:

(a) a piston cylinder;

(b) a first annular positioning ring with the piston cylinder extending radially through the first annular positioning ring and at least one channel disposed longitudinally in the first annular positioning ring in communication with the piston cylinder;

(c) a clamping band with a first end of the clamping band adjacent the first annular positioning ring, the clamping band surrounding a portion of a deformable inner wall, and the first end of the clamping band in communication with the at least one channel;

(d) a second annular positioning ring adjacent a second end of the clamping band, the annular positioning ring surrounding a portion of the inner wall, and

(e) the inner wall surrounding and forming a tool inner bore.

10. A hydraulic holder comprising:

(a) a toolholder having a hydraulic circuit in a toolholder bore wall;

(b) a deformable inner cartridge shell affixed fluid tight around the toolholder bore wall; and

(c) hydraulic fluid in the hydraulic circuit and a means for compressing the hydraulic fluid in the hydraulic circuit to deform the inner cartridge shell

inwardly to matingly engage a tool or workpiece located within the inner bore of the inner cartridge shell.

11. A hydraulic toolholder comprising:

(a) a toolholder having a hydraulic circuit in a nosepiece outside wall;

(b) a deformable outer cartridge shell affixed fluid tight around the nosepiece outside wall; and

(c) hydraulic fluid in the hydraulic circuit and a means for compressing the hydraulic fluid in the hydraulic circuit to deform the outer cartridge outwardly to matingly engage the bore of a tool or workpiece located around the outer cartridge shell.

12. A mandrel cartridge comprising:

(a) a deformable outer cartridge shell;

(b) surrounding a mandrel cartridge body;

(c) the mandrel cartridge body having a hydraulic circuit filled with hydraulic fluid, a means of displacing the hydraulic fluid within the hydraulic circuit, so that upon compression of the hydraulic fluid within the hydraulic circuit the deformable outer cartridge shell deforms outwardly for mating engagement with a bore in a tool or workpiece.

13. The mandrel cartridge of claim 12, also comprising a shank affixed to a first end of the mandrel cartridge in axial alignment with the first end of the mandrel cartridge shell.

14. A hydraulic mandrel holder comprising:

(a) a shank portion;

(b) a cylindrical end affixed to the shank portion in axial alignment with the shank portion;

(c) a mandrel cartridge having a deformable outer cartridge shell, a cartridge body, at least one deformable inner wall portion, and a cylindrical end bore, defined by the deformable inner wall in the cartridge body, in mating engagement with the cylindrical end;

(d) the cartridge body having a hydraulic circuit filled with hydraulic fluid and a means of compressing the hydraulic fluid within the hydraulic circuit, so that upon compression of the hydraulic fluid within the hydraulic circuit (i) the inner wall deforms inwardly for releasable fixed mating engagement with the cylindrical end and (ii) the deformable outer cartridge shell deforms outwardly for releasable fixed mating engagement with a bore in a tool or workpiece.

15. The process of removing air or excess hydraulic fluid from the hydraulic circuit of the hydraulic cartridge of claims 1 through 14, comprising the steps of:

(a) filling the hydraulic cartridge with hydraulic fluid through the piston cylinder;

(b) inserting a seal into the piston cylinder to the desired depth in the piston cylinder so that any air or excess hydraulic fluid will escape through an oil/air escape through-hole in the seal; and

(c) inserting a piston into the piston bore in axial alignment with the seal, so that a piston pin is matingly inserted into the oil/air escape through-hole in the seal.

16. The process of removing air or excess hydraulic fluid from the hydraulic circuit of the hydraulic cartridge of claim 15, further comprising the steps of:

(a) first inserting an insertion tube of an insertion tool into the oil/air escape through-hole in the seal and then, using the insertion tube, moving the seal in the piston cylinder to the desired depth in the piston cylinder, whereby any air or excess hydraulic fluid will escape into the bore of the insertion tube and out the through pipe of the insertion tool; and

(b) removing the insertion tool with its insertion tube from the piston cylinder and oil/air escape through-hole.

17. The process of filling the hydraulic circuit of the hydraulic cartridge of claims 1 through 14, comprising the steps of:

(a) placing the hydraulic cartridge in a air evacuation chamber;

(b) raising the piston cylinder end of the hydraulic cartridge above the opposite end of the hydraulic cartridge with the piston cylinder directed upwardly;

(c) lowering the pressure in the chamber to less than ambient pressure;

(d) filling the hydraulic cartridge through the piston cylinder;

(e) after the piston cylinder is full of hydraulic fluid and air ceases to exit through the piston cylinder, inserting a seal into the piston cylinder to the desired depth in the piston cylinder, whereby hydraulic fluid in the piston cylinder that is displaced by insertion of the seal escapes out of the oil/air escape tube; and

(f) removing the insertion tool and inserting a piston pin of a piston into the seal.

18. A method of retro-fitting a hydraulic toolholder having an intregral hydraulic circuit with a piston cylinder, seal, piston, and actuator, comprising the steps of:

(a) drilling a piston cylinder along a transverse axis of the nosepiece so that the piston cylinder intersects with the hydraulic circuit;

(b) filling the hydraulic circuit with hydraulic fluid;

(c) inserting a seal into the piston cylinder to the desired depth, whereby some of the hydraulic fluid escapes out of the seal oil/air escape through hole;

(d) inserting a piston into the piston cylinder so that the piston pin mates with the oil/air escape through hole in the seal; and

(e) inserting an actuator into the piston cylinder.

the seal is proximate to the at least one channel, and (ix) hydraulic fluid filling the portion of the piston cylinder proximate the seal, the at least one channel, the upper clamping band, the at least one clamping channel, and the lower clamping band.